

Washington University
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IMPURITY AND DEFECT BEHAVIOR IN
HIGH-PURITY EPITAXIAL GaAs

Interim Scientific Report No. #2
For The Period:
January 1, 1977, to December 31, 1977

Research Objectives

The objective of this work is to provide a better understanding of impurity and defect behavior in epitaxial GaAs, which should lead to more reproducible, uniformly-doped material for microwave device applications. To fulfill this objective various measurements are performed to investigate and identify impurities, defects, and their interactions; to determine how they are incorporated into the layer during growth; and to examine the effects of growth parameters on their behavior.

Significant Accomplishments

During the period covered by this report, we have obtained the following results: (1) a quantitative model of impurity incorporation for epitaxial layers grown on heavily-doped substrates was completed and published in Applied Physics Letters. This model shows that thin interfacial p-regions are inherent to the growth process. The model also predicts impurity gradients at the outer surface which has been verified experimentally. We are in the process of publishing this experimental verification since it provides additional proof that

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report summarizes research performed in an effort to obtain a better understanding of impurity and defect behavior in epitaxial GaAs. This work includes the identification of residual defects, the development of a model for impurity incorporation, and an examination of impurity gradient effects.		

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Personnel

The personnel working under this grant during this period were

Charles M. Wolfe, Professor; and
Kirby H. Nichols, Research Assistant.

Mr. Nichols is currently working towards a D.Sc. degree.

Scientific Papers

1. C. M. Wolfe, G. E. Stillman, and D. M. Korn, "Residual Donors in High Purity GaAs", Proc. 6th Int. Symp. GaAs (Inst. Phys., London, 1977) p. 120.
2. C. M. Wolfe and K. H. Nichols, "Impurity Gradients Caused by Surface States and Substrate Doping in Epitaxial GaAs", Appl. Phys. Lett. 31, 356 (1977).
3. K. H. Nichols, W. S. C. Chang, C. M. Wolfe, and G. E. Stillman, "GaAs Waveguide Detectors for 1.06 μm ", Appl. Phys. Lett. 31, 631 (1977).
4. K. H. Nichols and C. M. Wolfe, "Impurity Gradients and Impurity Incorporation in Epitaxial GaAs", (to be submitted to J. Electrochem. Soc.).

Scientific Interactions

Scientific interactions in the area of this research grant include informal discussions with G. McCoy, C. Litton, D. Reynolds, S. Nam, and R. Almassy of the U.S.A.F. Avionics Laboratory during June 16 and 17, 1977; discussions with G. Stillman of the University of Illinois during January and August 1977; and discussions with many people at the IEEE Device Research Conference and the AIME Electronic Materials Conference in Ithaca, New York, during June 1977.